REMARKS

Claim 13 has been amended. Thus, claims 9-20 remain presented for examination. Support for the amendment to claim 9 may be found in previous claim 1. Thus, no new matter has been added. Reconsideration and withdrawal of the present rejections in view of the amendments and comments presented herein are respectfully requested.

Rejections under 35 U.S.C. §103(a)

Sato (US 2004/0259028) alone

Claims 13-18 and 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sato (US 2004/0259028).

Claim 13 recites a resin that results in a resist composition that exhibits a high level of resolution, minimal LER, and a broad depth of focus, as well as a method for forming a resist pattern that uses such a resist composition. In order to generate such a resist composition, present claim 13 includes the following characteristics:

(1) A resist composition, comprising a resin component (A) that undergoes a change in alkali solubility in the presence of acid, and an acid generator component (B) that generates acid on exposure, wherein

(2) said resin component (A) has a weight average molecular weight of no more than 8,000 and comprises structural units (a) derived from a (meth)acrylate ester; and

(3) said component (B) a sulfonium compound represented by a general formula (b-1), and an onium salt-based acid generator comprising a straight-chain fluorinated alkylsulfonate anion of 1 to 7 carbon atoms, and

(4) the blend ratio (weight ratio) between the onium salt-based acid generator and the sulfonium compounds is within the range of 1:9 to 9:1.

Although, Sato discloses a resin (1) having a weight average molecular weight of 7800 (Sato: Table 2), this reference does not disclose or suggest the sulfonium compound represented by formula (b-1) as the acid generator, which is combined with the above resin as recited in present claim 13. Importantly, by mixing a sulfonium compound represented by general formula (b-1), and an onium salt-based acid generator comprising a straight-chain fluorinated alkylsulfonate anion of 1 to 7 carbon atoms together in a blend ratio of 1:9 to 9:1, a resin is obtained which has superior levels of line edge roughness (LER) and developing defects (see present specification at page 28, lines 17-19).

Moreover, when the weight average molecular weight of the resin that is combined with the mixture of acid generators is no more than 8000, the resulting resist composition exhibits unexpected and advantageous properties. Specifically, Examples 3 to 7 of the present application, which use the combination of the mixture of acid generators and the resin having the weight average molecular weight of 6200 to 7200, result in: a high level of resolution, a broad depth of focus, reduced levels of LER and low levels of developing defects (DOF: 500 nm; LER: 7.5 to 9.6 nm; developing defects: 0.04 to 0.5 defects/cm^2; pattern shape: Extremely vertical). In contrast, Comparative Example 2 of the present application which uses the resin having a weight average molecular weight of 9800 (which is not within the range recited in present claim 13), results in a narrow depth of focus (DOF: 300 nm), and much higher levels of LER and developing defects (LER: 15.0 nm; developing defects: 1350 defects/cm^2). Thus, even if the claims were *prima facie* obvious in view of Sato, the claimed invention provides unexpected results that would effectively rebut any such allegation.

Since Claim 13 is not obvious in view of Sato, then Claims 14-18 and 20, which directly or indirectly depend on Claim 13, are also not obvious.

Sato (US 2003/0108809) in view of Hatakeyama et al. (US 2002/0207201)

Claims 9-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sato (US 2003/0108809) in view of Hatakeyama et al. (US 2002/0207201).

Claims 9-12 and 19

Claim 9 recites a resin that results in a resist composition that exhibits a high level of resolution, minimal LER, and a broad depth of focus, as well as a method for forming a resist pattern that uses such a resist composition. In order to generate such a resist composition, Claim 9 includes the following characteristics:

(1) A resist composition, comprising a resin component (A) that undergoes a change in alkali solubility in the presence of acid, and an acid generator component (B) that generates acid on exposure, wherein

(2) said resin component (A) has a weight average molecular weight of no more than 7500 and comprises structural units (a) derived from a (meth)acrylate ester, wherein

(3) said structural units (a) comprise structural units (a1) derived from a (meth)acrylate ester containing an acid dissociable, dissolution inhibiting

group, structural units (a2) derived from a (meth)acrylate ester comprising a lactone-containing monocyclic group, and structural units (a3) derived from a (meth)acrylate ester comprising a hydroxyl group-containing aliphatic hydrocarbon group; and

(4) said component (B) comprises a sulfonium compound represented by a general formula (b-1).

Neither of the cited references disclose the recited feature that the weight average molecular weight of the resin is no more than 7500. In Sato, the weight average molecular weight of the resin is disclosed as from 3,000 to 100,000, which is a very broad range, with only a very small part of which overlapping with Applicants' claimed range. Furthermore, the weight average molecular weight of the resin used in Example 2 of Sato is more than 9,900. Thus, Sato does not disclose or suggest that the weight average molecular weight of the resin is no more than 7,500, as recited in present claim 9. Sato also fails to disclose or suggest the sulfonium compound represented by the formula (b-1) as recited in present claim 9. Sato discloses a resin comprising repeating units represented by formulas (I), (II), and (III), and a repeating unit including an alicyclic lactone.

Hatakeyama et al. discloses a sulfonium salt having a triarylsulfonium cation and an anion of formula (1)-26. However, Hatakeyama et al. does not disclose a polymer compound comprising the structural unit (a3) as a base resin which is combined with the sulfonium compound represented by the formula (b-1). In addition, a weight average molecular weight of the polymer compound of Hatakeyama et al. is from 5,000 to 100,000, which is also a very broad range, with only a very small part overlapping the range recited in Applicants' claims. Furthermore, the weight average molecular weight of the resin used in Example of Hatakeyama et al. is more than 8,300. Thus, Hatakeyama et al. does not disclose or suggest that the weight average molecular weight of the resin to no more than 7,500 as recited in present claim 9.

Claim 9 recites a combination of a sulfonium compound represented by the formula (b-1) with a resin comprising the structural units of (a1), (a2) and (a3) which has a weight average molecular weight of no more than 7500. In conventional practice, the anionic (acid) portion of onium salts used as acid generators are almost all chain-like fluorinated alkylsulfonate ions. However, such fluorinated alkylsulfonic acids in which the alkyl chain contains 4 or more carbon atoms have safety concerns (see present specification, page 2, lines 11 to 21). In contrast, present Claim 9 recites a sulfonium compound represented by the formula (b-1) as the acid generators, without using the above types of long-chain fluorinated alkylsulfonic acids. However, if the

sulfonium compound is simply combined with conventional ArF resins, then satisfying the requirement for fine levels of resolution, together with LER and DOF requirements, is still problematic (see present specification at page 3, lines 7-12).

Thus, Claim 9 of the present application recites a resin comprising structural units (a1), (a2) and (a3), and has a weight average molecular weight of no more than 7500. The recited is resin is combined with the sulfonium compound represented by formula (b-1). By using the combination of the above specific resin and the above specific acid generator, a satisfactory level of resolution can be ensured, while the LER and DOF can be improved dramatically compared with resist compositions using conventional resins. Furthermore, other characteristics (such as the resist pattern shape and the level of developing defects) are also significantly superior to those obtained using conventional resins (present specification at page 3, line 20 to page 4, line 3). These effects are clearly shown in Examples 1 and 2 of the present application, when compared to Comparative Example 1.

Specifically, Examples 1 and 2, which use a resin having a weight average molecular weight of no more than 7500, and comprises the structural units (a1), (a2) and (a3), result in a broad DOF (450 nm). In contrast, Comparative Example 1 which uses a resin having a weight average molecular weight of 9500 and also comprises structural units (a1), (a2) and (a3) results in a narrow DOF (350 nm). In addition, the level of LER is reduced in Examples 1 and 2 (Example 1: 10 nm; Example 2: 10.1 nm), but the level of LER is not improved in the Comparative Example (18.0 nm). Developing defects are also reduced in Examples 1 and 2 (Example 1: 0.07 defects/cm^2; Example 2: 0.04 defects/cm^2), but developing defects are not reduced in Comparative Example 1 (400 defects/cm^2) (Table 1 and 2).

Therefore, it is apparent that the combination of the sulfonium compound represented by the formula (b-1) and the resin comprising the structural units of (a1), (a2) and (a3) which has a weight average molecular weight of no more than 7500 results in significant, unexpected results.

Neither Sato nor Hatakeyama et al. teach or suggest the advantageous features discussed above associated with use of a resin having a weight average molecular weight of no more than 7,500 which comprises the structural units (a1), (a2) and (a3). In addition, these results could not have been predicted based upon Sato or Hatakeyama et al., either alone or in combination, and would effectively rebut any case of *prima facie* obviousness if one were present.

Since Claim 9 is nonobvious over Sato and Hatakeyama et al, then Claims 10-12 and 19,which directly or indirectly depend on Claim 9, are also nonobvious.

Claims 13-18 and 20

As described above, the weight average molecular weight of the resin of Sato (US 2003/0108809) is from 3,000 to 100,000. Furthermore, the weight average molecular weight of the resin used in Example 2 of Sato is more than 9,900. Thus, Sato does not disclose or suggest that the weight average molecular weight of the resin should be no more than 8,000. In addition, Sato does not disclose the sulfonium compound represented by the formula (b-1). Thus, Sato dose not disclose or suggest the use of a combination of a sulfonium compound represented by the formula (b-1), and a resin having a weight average molecular weight of no more than 7,500.

As described above, Hatakeyama et al. discloses a sulfonium salt having a triarylsulfonium cation and an anion of formula (1)-26, and a trifluoromethanesulfonate. However, Hatakeyama et al. does not disclose blending these acid generators in a specific ratio.

In addition, the weight average molecular weight of the resin of Hatakeyama et al. is from 5000 to 100000, and the weight average molecular weight of the resin used in Example of Hatakeyama et al. is more than 8,300. Thus, Hatakeyama et al. does not disclose or suggest that the weight average molecular weight of the resin should be no more than 8,000. In addition, Hatakeyama et al. does not mention or suggest the advantageous effects of the above combination. Thus, the claims cannot be *prima facie* obvious over thee references,

However, even if the claims were *prima facie* obvious in view of these references, the claimed invention provides the unexpected results discussed above. Such unexpected results could not have been predicted based on the teachings of these references either alone or in combination, and would effectively rebut any allegation of *prima facie* obviousness.

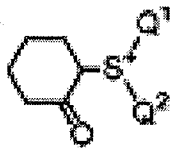
Thus, Applicants submit that claims 13, and claims 14-18 and 20, which depend either directly or indirectly from claim 13, are nonobvious over the cited combination of references.

Uetani et al. (US 2001/0014428) in view of Hatakeyama et al. (US 2002/0207201), and in further view of Uetani et al. (US 6,348,297)

Claims 13-18 and 20 were rejected under 35 U.S.C. § 1039a) as being unpatentable over Uetani et al. (US 2001/0014428) in view of Hatakeyama et al. (US 2002/0207201), and in further view of Uetani et al. (US 6,348,297).

Neither Uetani et al. reference discloses or suggests a sulfonium compound represented by the formula (b-1) as recited in present claim 13. As discussed above, Hatakeyama et al. does not disclose that the sulfonium compound represented by the general formula (b-1) and the onium salt-based acid generator are blended in the specific ratio recited in present claim 13.

Uetani et al. disclose an aliphatic sulfonium salt represented by the following formula (I):



$C_mF_{2m+1}SO_3^-$ (I)

In the aliphatic sulfonium salt represented by the formula (I), the number of carbon atoms in a portion of perfluoroalkanesulfonate anion is small. When such a salt is employed, not only is a sufficient resolution hard to attain, but a good pattern profile is also hard to achieve, especially on a basic substrate. Thus, Uetani et al. discloses using a combination of the aliphatic sulfonium salt of the formula (I) and at least one onium salt selected from compounds represented by a formula (IIa) or (IIb) with a specific blend ratio (Uetani et al, column 4, lines 42 5). By using the mixture of these compounds, resolution can be increased compared to the use of an aliphatic sulfonium salt represented by the formula (I). However, the blend ratio disclosed by Uetani et al. increases the resolution only in the case of using the aliphatic sulfonium salt represented by the formula (I). Based on this teaching, one of ordinary skill in the art would not have any reason to combine the blend ratio of Uetani et al. and the acid generators of Hatakeyama et al. Accordingly, the claims cannot be *prima facie* obvious in view of these references.

However, even if the claims were *prima facie* obvious in view of these references, the claimed invention provides the significant unexpected results discussed above. Such unexpected results could not have been predicted based on the teachings of these references either alone or in combination, and would effectively rebut any allegation of *prima facie* obviousness. Thus, Applicants submit that claims 13, and claims 14-18 and 20, which depend either directly or indirectly from claim 13, are nonobvious over the cited combination of references.

In view of the comments presented above, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a).

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CONCLUSION

Applicants submit that all claims are in condition for allowance. Should there be any questions concerning this application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Respectfully submitted,

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Dated: 12/11/08

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